WE CLAIM:

1. A fuel processor, comprising:

a hydrogen-producing region adapted to receive a carbon-containing feedstock and water and produce a mixed gas stream containing hydrogen gas and other gases therefrom; and

a membrane module adapted to receive the mixed gas stream and to separate the mixed gas stream into a byproduct stream containing at least a substantial portion of the other gases and a product stream containing at least substantially hydrogen gas, the membrane module comprising:

a hydrogen-selective membrane having a feed side and a permeate side, wherein the product stream is formed from a portion of the mixed gas stream that passes through the membrane and the byproduct stream is formed from a portion of the mixed gas stream that does not pass through the membrane, wherein the membrane is at least substantially comprised of an alloy comprising palladium and copper and further wherein the membrane has an average thickness of approximately 25 microns or less, and further wherein the membrane includes at least one region containing a patch material that is at least substantially formed from a material having a different composition than the alloy; and

a support adapted to support the membrane, wherein the support includes a surface adapted to engage the permeate side of the membrane.

2. The fuel processor of claim 1, wherein the patch material is a hydrogen-permeable material.

3. The fuel processor of claim 1, wherein the patch material is not a hydrogen-permeable material.

4. The fuel processor of claim 1, wherein the patch material comprises one or more of the group consisting of copper, silver, gold, nickel, palladium, chromium, rhodium, platinum and mixtures, compounds and alloys thereof.

5. The fuel processor of claim 4, wherein the patch material is free of phosphorous, carbon, silicon, and nitrogen.

6. The fuel processor of claim 5, wherein the patch material is free of zinc, mercury, lead, bismuth and cadmium.

7. The fuel processor of claim 4, wherein the patch material is free of zinc, mercury, lead, bismuth and cadmium.

8. The fuel processor of claim 1, wherein the patch material is free of phosphorous, carbon, silicon, and nitrogen.

9. The fuel processor of claim 1, wherein the patch material is free of zinc, mercury, lead, bismuth and cadmium.

10. The fuel processor of claim 1, wherein the patch material is applied to the membrane after formation of the membrane.

11. The fuel processor of claim 10, wherein the patch material is applied to the membrane via a plating process.

12. The fuel processor of claim 1, wherein the membrane has a thickness of less than approximately 20 microns.

13. The fuel processor of claim 1, wherein the membrane has a thickness of 15 microns or less.

14. The fuel processor of claim 1, wherein the hydrogen-producing region includes at least one reforming region containing a reforming catalyst bed.

15. The fuel processor of claim 1, wherein the membrane includes at least one etched region.

16. The fuel processor of claim 15, wherein the at least one etched region includes a central region of the membrane, and further wherein the membrane includes an unetched perimeter region of greater thickness than the central region.

17. The fuel processor of claim 1, wherein the membrane module includes a pair of the hydrogen-selective membranes positioned on opposed sides of the support so that the permeate surfaces of the membranes generally face each other, with the support at least partially defining a harvesting conduit between the pair of membranes and through which the portion of the mixed gas stream that passes into the conduit through at least one of the pair of membranes may be withdrawn from the conduit.

18. The fuel processor of claim 1, wherein the membrane module is adapted to receive the mixed gas stream at a pressure of at last 50 psig and a temperature of at least 200° C.

19. The fuel processor of claim 1, wherein the membrane is adhesively bonded to the support during fabrication of the membrane module and thereafter subjected to oxidizing conditions after formation of the membrane module.

20. The fuel processor of claim 1, wherein the support is adapted to enable the portion of the mixed gas stream that passes through the membrane to flow within the support transverse and parallel to the permeate side of the membrane.

21. The fuel processor of claim 1, wherein the support is at least partially formed from a porous medium.

22. The fuel processor of claim 1, wherein the support includes a screen structure having a membrane-contacting screen member.

23. The fuel processor of claim 22, wherein the membrane-contacting screen member is at least partially formed from an expanded metal material.

24. The fuel processor of claim 22, wherein the membrane-contacting screen member is at least partially formed from mesh.

25. The fuel processor of claim 22, wherein the screen structure includes a plurality of screen members.

26. The fuel processor of claim 25, wherein the plurality of screen members are adhesively bonded together during fabrication of the membrane module and thereafter subjected to oxidizing conditions after formation of the membrane module.

27. The fuel processor of claim 1, wherein the membrane module further includes end plates between which the membrane and the support are supported.

28. The fuel processor of claim 27, wherein the end plates include an inlet port through which at least a portion of the mixed gas stream is delivered to the permeate side of the membrane, a product outlet port through which the portion of the mixed gas stream that passes through the membrane is withdrawn from the membrane module, and a byproduct port through which the portion of the mixed gas stream that does not pass through the membrane is withdrawn from the membrane module.

29. The fuel processor of claim 1, wherein the fuel processor includes a combustion region and further wherein the fuel processor includes at least one gas transport conduit adapted to deliver at least a portion of the byproduct stream to the combustion region.

30. The fuel processor of claim 1, wherein the fuel processor includes a polishing region adapted to receive the portion of the mixed gas stream that passes through the membrane and to further reduce the concentration of at least a selected component of the other gases therein.

31. The fuel processor of claim 30, wherein the polishing region includes at least one methanation catalyst bed.

32. The fuel processor of claim 1, in combination with a fuel cell stack adapted to receive at least a portion of the product stream and to produce an electric current therefrom.